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Biological Characteristics of Adult Atlantic Salmon (*Salmo salar* L.) from the Margaree River, Nova Scotia, 1987 to 1996

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2005

Canadian Data Report of Fisheries and Aquatic Sciences 1172

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Canadian Data Report of
Fisheries and Aquatic Sciences 1172

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Her Majesty the Queen in right of Canada, 2005
Cat. No. Fs 97-13/1172E ISSN 0706-6465

Correct citation for this publication:

LeBlanc, P. H., Jones, R. A., and Chaput, G. 2005. Biological Characteristics of Adult Atlantic Salmon (*Salmo salar* L.) from the Margaree River, Nova Scotia, 1987 to 1996. Can. Data Rep. Fish Aquat. Sci 1172: vi + 28 p.

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ABSTRACT

This report summarizes the biological characteristics of adult Atlantic salmon (*Salmo salar* L.) of the Margaree River obtained from estuarine trapnets operated from 1987 to 1996. Wild origin salmon made up 84% of the small salmon and 94% of the large salmon catches for all years combined. Maiden salmon were the most abundant spawning history group observed during the ten years of sampling with repeat spawners averaging 8% of the samples. Within the maiden salmon group, 2SW salmon were dominant. Within the repeat spawners, fish that spawned initially as maiden 2SW were the most numerous representing 77% of the repeat-spawning component with most returning to a second spawning as alternate spawners. The maximum number of repeat-spawnings observed was four. The freshwater or smolt age ranged from two to five years. For all categories of maiden salmon, two-year old smolt were the most abundant. Repeat-spawning salmon freshwater ages were similar to those of the maiden salmon. Fork lengths at age were slightly longer for fall fish relative to summer run fish. Males were more abundant in the 1SW maiden and repeat 1SW spawner groups whereas females were more abundant in the 2SW, 3SW and repeat 2SW and 3SW spawners. Characteristics of Margaree salmon were similar to other rivers from the southern Gulf of St. Lawrence.

RÉSUMÉ

Le présent rapport résume les caractéristiques biologiques de saumons atlantiques (*Salmo salar* L.) adultes capturés de 1987 à 1996 dans l'estuaire de la rivière Margaree au moyen de filets-pièges. Les saumons d'origine sauvage ont constitué 84 % des petits saumons et 94 % des gros saumons capturés durant cette période. Les saumons frayant pour la première fois étaient les plus abondants des géniteurs observés durant les dix ans d'échantillonnage, tandis que les saumons ayant déjà frayé auparavant ont constitué en moyenne 8 % des échantillons. Le groupe des géniteurs frayant pour la première fois était dominé par les saumons dibermarins. Quant au groupe de saumons ayant déjà frayé auparavant, les plus abondants (77 %) étaient les saumons dont la première fraie s'était produite après deux ans en mer (dibermarins); la plupart d'entre eux frayaient pour la deuxième fois deux ans après leur première fraie. Le nombre maximal de fraies observées pour un même saumon a été de quatre. L'âge d'eau douce, ou âge des saumoneaux, variait de deux à cinq ans. Les saumoneaux de deux ans étaient les plus abondants des saumons frayant pour la première fois. Les âges d'eau douce des saumons ayant déjà frayé auparavant étaient semblables à ceux des saumons frayant pour la première fois. La longueur à la fourche selon l'âge était légèrement plus élevée chez les saumons de remonte automnale que chez les saumons de remonte estivale. Les mâles dominaient les groupes des saumons unibermarins frayant pour la première fois et de ceux ayant déjà frayé auparavant, tandis que les femelles étaient plus abondantes que les mâles au sein des quatre groupes suivants : géniteurs dibermarins frayant pour la première fois, géniteurs tribermarins frayant pour la première fois, géniteurs dibermarins ayant déjà frayé auparavant et géniteurs tribermarins ayant déjà frayé auparavant. Les caractéristiques des saumons de la rivière Margaree étaient semblables à celles observées dans d'autres rivières se jetant dans la partie sud du golfe du Saint-Laurent.

106-01953/

INTRODUCTION

The Margaree River, situated in Cape Breton Island (Inverness County, Nova Scotia) is the largest river in Gulf Nova Scotia with a drainage area of 1,178 km^2. It is comprised of two branches, the Northeast and the Southwest, which meet at Margaree Forks to form the Margaree River. It flows into the south-eastern portion of the Gulf of St. Lawrence at 46°30'N by 61°10'W (Fig. 1). The Margaree River has been estimated to contain 2.8 million m^2 of Atlantic salmon (*Salmo salar* L.) juvenile rearing habitat (Chaput and Jones 1991).

Atlantic salmon is a highly prized sport fish in the Margaree River with angling catches exceeding 1,000 fish annually between 1985 and 1996 (Marshall et al. 2000). Maximum reported catch (NS licence stub returns) in any year was 3,272 fish in 1986 (Marshall et al. 2000). The Margaree River has traditionally been considered to have two run components, the summer run which for statistical purposes ends on August 31, and the fall run occurring from September 1 onwards (Claytor et al. 1995).

The following report summarizes the biological characteristics, primarily age composition, length at age and sex ratios, of adult Atlantic salmon from the Margaree, based on catches sampled at the estuarine trapnets. The trapnet monitoring program which began in 1987 and ended in 1996, had the objective of assessing the returns and stock status of Atlantic salmon to the Margaree River. Claytor (1996) summarized some of the run-timing data from the estuarine trapnet catches. Some biological data from this program have also been previously summarized (Claytor and Jones 1990; Claytor et. al. 1995).

METHODS

Estuary trapnets were operated by the Department of Fisheries and Oceans (DFO) between 1987 and 1996. The purpose of these trapnets was to collect biological characteristics of returning salmon to the Margaree River and to conduct mark and recapture experiments for stock assessment. Trapnet design and placement evolved over time and Trap-4 (Levis, Fig. 1, Table 1) became the index trapnet location and was operated during the entire migration period of salmon from 1992 to 1996.

The lower trap (Trap 1) was in operation between 1987 and 1990. It was located 0.75 km upstream of the Margaree harbour bridge (Fig. 1). A T-trap design similar to the commercial fishers on the Miramichi River, NB was used in 1987 (Fig. 2). The trap itself was constructed of 5.7 cm knotless nylon mesh and measured 4.27 m deep by 3.66 m wide and 18.9 m long. The leader extended 91.4 m to shore and consisted of 14 cm and 15.24 cm mesh (Claytor and Chaput 1987). During the months of September and October, a section (45.7 m in length) of 5.1 cm mesh was substituted at the shore end of the leader to prevent meshing of salmon. In 1988 this trap was replaced with a V-trap design (Fig. 3). This trap was constructed of 3.5 cm knotless nylon mesh with dimensions 3.66 m deep by 3.66 m wide and 15.24 m long (Claytor and Chaput 1988). Both leaders were constructed of 7.6 cm knotted nylon mesh. The shore wing leader was 91.4 m long and the outside wing leader was 30.5 m long. This trap design and location were

used until 1990. Due to the vast amount of algae growth as well as the amount of jelly fish which entered the trapnet at this location in the summer period, this location was not used after 1990.

The upper trap (Trap 2) was in operation between 1988 and 1992. It was located 1.3 km upstream of trap 1 (Fig. 1). The T-trap used at site 1 in 1987 was relocated to this site in 1988. The leader was constructed of 5.7 cm knotless nylon mesh (Claytor and Chaput 1988). Between 1989 and 1992, a V-trap, as described previously, was used. During 1993 and 1994, this site was used by First Nations to operate a food fishery trap. No information from the food fishery is contained within this report.

The island trap (Trap 3) operated during 1993. It was located 1.0 km upstream of trap 2 and was a T-trap design of similar construction to Trap 2.

Levis trap (Trap 4) was in operation between 1991 and 1996. It was located 2.5 km upstream of trap 3 (Fig. 1) and was a V-trap design (Fig. 3) with trap and leader configurations similar to Trap-2. Annual variations in mesh size are described in Marshall et. al (1996).

The annual dates of operation of the trapnets are summarized in Table 1. The trapnets were generally fished once daily on the first slack tide during daylight hours, except during extreme weather conditions when the trapnets could not be tended. Atlantic salmon were measured for fork length (mm) and a sample of 4 to 6 scales was removed from the standard location (Shearer 1989) for the determination of age and spawning history. Origin of the fish, either wild or hatchery, was determined based on the presence (wild) or absence (hatchery) of the adipose fin (Table 2). As not all hatchery juvenile fish had been marked with an adipose fin clip prior to stocking in the river, unclipped hatchery fish could generally not be distinguished from wild salmon. Sex determination was based on external characteristics (presence or absence of a kype) and for the purpose of this report only fish captured on or after September 1 were used to determine sex ratios.

Ages were interpreted from scales based on criteria described in MacPhail (1974) and Shearer (1989). Repeat-spawning salmon are identified by the presence of spawning marks on the scales (Table 2; Fig. 4).

RESULTS AND DISCUSSION

Total annual catches at individual trapnets ranged from 27 to 304 small salmon and from 42 to 602 large salmon (Table 3). The catches from all trapnets operating in a given year represented 2% to 18% of small salmon and 3% to 17% of large salmon total estimated returns to the river (Table 3). It should be noted that the entire migration period (June-October) of Atlantic salmon was not monitored in all years. Beginning in 1992, the Levis trapnet covered the entire migration period as it was operated during the months of June to October over a five year period. Wild origin salmon were dominant in both size groups (small, large) during both summer and fall in all years (Table 4). Hatchery origin salmon were more abundant for both small and large salmon during the summer run relative to the fall run. Overall proportions of wild origin large salmon ranged from 0.91 to 0.99 (Table 4).

Wild salmon characteristics

Three sea-age groups of maiden salmon and 18 sea-age group combinations of repeat spawners have been sampled in the Margaree River (Table 2 and 5). The small salmon category was comprised of 94% to 100% maiden 1SW salmon with a few maiden 2SW salmon and 1C repeat spawners (Table 6). The large salmon category was comprised primarily of maiden 2SW salmon with small numbers of maiden 1SW and 3SW salmon and repeat spawners (Table 6).

Maiden salmon were the most abundant spawning history group observed during the ten years of sampling (Tables 5 and 6). Maiden 1SW salmon made up 30% of the 4,728 age determinations, ranging between 13% and 56% annually (Table 7). Maiden 2SW salmon averaged 59% of all age determinations, annual range of 35% to 72%. Maiden 3SW salmon made up only 4% with an annual range of 1% to 9% (Table 7).

Repeat spawners averaged 8% of the samples processed, within an annual range of 6% to 10% during the ten year period (Table 7). Of all repeat spawners, fish that spawned initially as maiden 2SW salmon were the most numerous representing 77% of the repeat-spawning component (Table 5). The oldest salmon sampled were 10 years old (2 years fresh water, 8 years sea), were on their fourth spawning migration, and all had originally matured as 2SW salmon (Table 5). For all years combined, 5% of the fish sampled during the summer were repeat spawners compared to 9% for fish sampled during the fall (Table 5). The alternate spawner (Table 2) life history was the more common second spawning life history trait particularly in the summer component (Tables 5 to 7).

The freshwater age, or age at smoltification for wild origin salmon, ranged from two to five years (Fig. 5; Tables 8 and 9). In nine of the ten years, the majority of the 1SW salmon were 2 year old smolt. For all years combined, two-year smolt made up 60%, three-year old smolt 37% and four-year old smolt less than 3% of the 1SW samples (Table 8). Only one five-year old smolt was observed during the ten years of sampling. The maiden 2SW group was dominated by two-year old smolt, averaging 62% for all years combined, with 37% three-year old smolt, and less than 1% four-year old smolt (Table 8). The maiden 3SW fish was also dominated by two-year old smolt averaging 77% for all years combined, with 22% three-year old smolt and less than 1% four-year old smolt (Table 8). The freshwater ages of the repeat-spawning salmon were similar to those of the maiden age groups, with 1SW repeat spawners (1C, 1A) comprised of 54% two-year old smolt, 42% three-year old smolt, and 4% four-year old smolt (Table 9). The 2SW repeat-spawning salmon were comprised of 69% two-year old smolt, 30% three-year old smolt, and 1% four-year old smolt. The 3SW repeat-spawning salmon were comprised of 83% two-year old smolt, and 17% three-year old smolt (Table 9).

During 1987 to 1996 for all trapnets combined, 1SW salmon fork length varied from 41.0 cm to 66.3 cm, with a mean of 55.3 cm (Table 10; Fig. 6). Mean fork length of 1SW salmon captured during the summer was 54.2 cm and 56.2 cm during the fall. Fork length for maiden 2SW salmon varied from 62.5 cm to 93.5 cm, with a mean of 75.5 cm (Table 10; Fig. 6). Mean fork length for 2SW salmon captured during the summer was 74.3 cm and 76.1 cm during the fall. Fork length for maiden 3SW salmon varied from 74.0 cm to 104.0 cm, with a mean of 89.0 cm.

Mean fork length for 3SW salmon captured during the summer was 87.5 cm and 89.3 cm during the fall.

Lengths of repeat-spawning salmon ranged between 60.0 and 116.0 cm with the majority in the 84.0 to 100.0 cm length range (Fig. 7). Mean fork length for 1SW alternate spawning (1A) salmon was 81.1 cm compared to 66.2 cm for 1SW consecutive spawning (1C) salmon (Table 11). Mean fork length for 2SW alternate spawning (2A) salmon was 92.3 cm compared to 84.4 cm for 2SW consecutive spawning (2C) salmon (Table 11).

Fall sampling from the Margaree River indicated that the 1SW salmon were comprised of 4% to 43% female, with a mean of 16% (Table 12). Maiden 2SW salmon were from 56% to 79% female, with a mean of 72%. Maiden 3SW salmon were from 78% to 100% female, with a mean of 89% (Table 12). Repeat 1SW alternate (1A) and consecutive (1C) salmon were predominantly male, 73% male and 82% male, respectively (Table 13). Repeat 2SW alternate (2A) and consecutive (2C) salmon were predominantly female, 89% female for both groups (Table 13). The few repeat 3SW alternate (3A) and consecutive (3C) salmon sampled were mostly female, 95% and 94% female, respectively (Table 13).

Hatchery salmon characteristics

Annual catches of hatchery origin fish ranged from 2 to 85 small salmon and 2 to 42 large salmon (Table 4). Hatchery origin salmon represented on average 16% of the small salmon catch and 6% of the large salmon catch over the ten year period. Two-year old smolts were the dominant freshwater age of all maiden sea-age groups (Table 14).

Fork lengths of 1SW salmon ranged between 46.6 cm and 65.0 cm, with a mean of 55.5 cm (Table 15; Fig. 8). Maiden 2SW salmon fork length varied from 65.8 cm to 90.0 cm, with a mean of 75.0 cm. Maiden 3SW salmon varied from 81.5 cm to 91.0 cm, with a mean of 84.8 cm (Table 15).

Males were more abundant in the maiden 1SW salmon component, averaging 83% within an annual range of 33% to 100% (Table 16). Maiden 2SW salmon were comprised of a more balanced ratio of males to females, averaging 55% female with an annual range of 33% to 100% (Table 16). Two of the three 3SW hatchery origin salmon caught were determined to be female, the other could not be sexed (Table 16).

CONCLUSION

The biological characteristics of Margaree River salmon are similar to those observed in other rivers of south-eastern New Brunswick and Gulf Shore Nova Scotia. Large salmon were more abundant than small salmon, similar to the run composition of the neighbouring Cheticamp River (Landry et al. 2005) and the Buctouche River in southeastern New Brunswick (Atkinson 2001). This contrasts with the Miramichi River where small salmon outnumber large salmon by about three to one (Chaput et al. 2001). Maiden salmon were the most abundant spawning history group in all of these rivers. For the years when the entire run was sampled (1992 to 1996), repeat

spawners represented between 8% and 12% of the large salmon category, values similar to those of the Cheticamp River in 2004 (Landry et al. 2005) but less than the values reported for the Buctouche River (6% to 22%, Atkinson 2001), the Nepisiguit River (21% to 45%, Mowbray and Locke 1998) and the Miramichi River (increasing to 50% in 1992, Moore et al. 1995). Age at smoltification was similar between the Margaree, Cheticamp and the Bouctouche rivers except for the Bouctouche maiden 1SW salmon which had a higher percentage of three-year old smolt (Atkinson 2001). Fork lengths at age are also similar among these rivers. As well, the sex ratio characteristics are similar, with males dominant in the 1SW maiden group and females in the 2SW and 3SW maiden spawning groups (Atkinson 2001; Chaput et al. 2001; Landry et al. 2005; Mowbray and Locke 1998).

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to all the DFO personnel involved in the trapnet program: Ross Claytor who initiated the program in 1987, Leonard Forsyth, Karen Rutherford, and Larry Marshall. We greatly appreciated the expertise and contractual support of Alexander and Arthur MacKay during the initial years of operation of the program with supporting crew of Byron MacKay, Peter Rankin, and Raymond MacKenzie. Numerous summer students also helped maintain and operate the trapnets over the years. Thanks to Noella McDonald of DFO Oceans and Science (Moncton) for age verification of the particularly difficult 3SW and repeat spawner interpretations. Thanks are also extended to Scott Douglas and David Moore for providing constructive review and comments on this report.

REFERENCES

Atkinson, G. 2001. Biological characteristics of adult Atlantic salmon (*Salmo salar*) in the Buctouche River, New Brunswick, 1992 to 2000. Can. Data Rep. of Fish. Aquat. Sci. 1076: 22 p.

Chaput, G. and R. Jones. MS 1991. Evaluating spawning requirements, returns, escapements and surpluses to conservation levels of Atlantic salmon for selected Gulf Nova Scotia rivers. CAFSAC Res. Doc. 91/73. 23p.

Chaput, G., Moore, D., Hayward, J., Sheasgreen, and B. Dubee. 2001. Stock status of Atlantic salmon (*Salmo salar*) in the Miramichi River, 2000. DFO Can. Sci. Adv. Sec. Res. Doc. 2001/008. 88p.

Claytor, R.R. 1996. Weekly fish counts from in-river traps, counting fences, barrier pools, and fishways in southern Gulf of St. Lawrence rivers, from 1952-1993. Can. Data Rep. Fish. Aquat. Sci. No. 982. 143p.

Claytor, R.R. and G.J. Chaput. 1987. Assessment of Atlantic salmon (*Salmo salar*), in the Margaree River, 1987. CAFSAC Res. Doc. 87/105. 36p.

Claytor, R.R. and G.J. Chaput. 1988. Assessment of Atlantic salmon (*Salmo salar*), in the Margaree River, 1988. CAFSAC Res. Doc. 88/75. 43p.

Claytor, R.R. and R. Jones. 1990. Assessment of Atlantic salmon (*Salmo salar*) in the Margaree River, 1989. CAFSAC Res. Doc. 90/27. 22p.

Claytor, R.R., R. Jones, P. LeBlanc, and L. Forsyth. 1995. Assessment of the Atlantic salmon (Salmon salar) stock of the Margaree River, Nova Scotia,1994. DFO Atl. Fish. Res. Doc. 95/63. 71 p.

Landry, D., G.J. Chaput, and J. Bridgeland. 2005. Stock status of Atlantic salmon (*Salmo salar*) in the Cheticamp River, Cape Breton Highlands National Park, Nova Scotia, for 2004. DFO Can. Sci. Adv. Sec. Res. Doc. 2005/022. 19 p.

MacPhail, D.K. 1974. Photographic reproductions of Atlantic salmon scales from fish of known sea ages. Environment Canada Fisheries and Marine Service Technical Report Series No. MAR/T-74-1. 55 p.

Marshall, T.L., R. Jones. P. LeBlanc, and L. Forsyth. 1996. Status of Atlantic salmon of the Margaree and other selected rivers of Cape Breton Island, 1995. DFO Can. Stock Assess. Sec. Res. Doc. 96/142. 81p.

Marshall, T.L., L. Forsyth, R. Jones, P. LeBlanc, and K. Rutherford. 1997. Status of Atlantic salmon stocks in selected rivers of Cape Breton Island, 1996. DFO Can. Stock Assess. Sec. Res. Doc. 97/23. xi + 70 p.

Marshall, T.L., P.H. LeBlanc, K.A. Rutherford, and R.A. Jones. 2000. Assessments of Atlantic salmon stocks in selected rivers of Cape Breton Island, 1999. DFO Can. Stock Assess. Sec. Res. Doc. 2000/008.

Mowbray, F.K. and A. Locke. 1998. Biological characteristics of Atlantic salmon (*Salmo salar* L.) in the Nepisiguit River, New Brunswick, 1982-1996. Can. Tech. Rep. Fish. Aquat. Sci. 2236. iv + 32 p.

Moore, D.S., Chaput, G.J., and P.R. Pickard. 1995. The effect of fisheries on the biological characteristics and survival of mature Atlantic salmon (*Salmo salar*) from the Miramichi River. p. 229-247. *In* E.M.P. Chadwick (editor). Water, science, and the public: the Miramichi ecosystem. Can. Spec. Publ. Fish. Aquat. Sci. 123.

Shearer, W.M. 1989. Report of the second Atlantic salmon scale reading workshop, Aberdeen, Scotland, 12-14 October 1988. International Council for the Exploration of the Sea, Anadromous and Catadromous Fish Committee CM 1989/M:7. 52 p.

Table 1. Dates of operation of the trapnets in the Margaree River estuary, 1987 to 1996.

	Trapnet location			
Year	Lower (Trap 1)	Upper (Trap 2)	Island (Trap 3)	Levis (Trap 4)
1987	June 23 - October 17[a]			
1988	September 2 - October 22	August 29 - October 22[d]		
1989	August 28 - October 16[b]	August 29 - October 16[e]		
1990	June 5 - October 16[c]	June 28 - October 17[f]		
1991		June 11 - August 28[g]		July 6 - August 30
1992		July 7 - October 20[h]		June 15 - October 14
1993			June 22 - October 18[i]	June 14 - October 18[i]
1994				June 13 - October 22[k]
1995				June 13 - October 20
1996				June 10- October 24[l]

[a] Trap operated for seven 1-week periods between June 23rd and October 17th.

[b] September 27th trapnet completely underwater.

[c] Trap fished two periods; June 5th - July 20th and September 4th - October 16th.

[d] September 30th not set to try and correct seal problem.

[e] September 27th trap underwater, October 11th not able to reset because of strong current.

[f] Trap fished two periods; June 28th - July 26th and September 5th - October 17th.

[g] July 17th - August 2nd trap not set because of large numbers of jellyfish.

[h] Trap fished for two periods; July 7th - July 26th and August 31st - October 20th.

[i] August 5th - August 9th trap washed out.

[j] August 5th - August 17th trap washed out.

[k] October 2nd - October 6th trap washed out.

[l] Trap brailed over night on September 15th, September 24th, September 30th - October 2nd, and October 9th

Table 2. Terms and acronyms used to describe Atlantic salmon size and age characteristics.

Term/acronym	Description
Small salmon	fish of fork length less than 63 cm
Large salmon	fish of fork length greater than or equal to 63 cm
Wild salmon	salmon which originated from natural spawning
Hatchery salmon	salmon which are known to have been artificially incubated in the hatchery and are identifiable by the absence (clipped) of the adipose fin
Maiden salmon	salmon returning to fresh water to spawn for the first time
Repeat spawner	salmon on a second or greater spawning migration
1SW salmon	maiden salmon which have spent one winter at sea
2SW salmon	maiden salmon which have spent two winters at sea
3SW salmon	maiden salmon which have spent three winters at sea
MSW salmon	multi-sea-winter salmon including maiden and repeat spawners of a total sea age greater than one year. (This excludes 1SW salmon)
Consecutive spawners	repeat-spawning salmon which spawn in two years consecutively
Alternate spawners	repeat-spawning salmon which spend an entire year at sea between successive spawning events
1C; 2C	repeat spawner originally matured as a 1SW (1C) or 2SW (2C) and returning for a second spawning as a consecutive spawner
1A; 2A	repeat spawner, originally matured as a 1SW (1A) or 2SW (2A) and returning for a second spawning as an alternate spawner
1CR; 2CR	repeat spawner returning for a third or greater spawning, originally mature as a 1SW (1CR) or 2SW (2CR) with a second spawning as a consecutive
1AR; 2AR	repeat spawner returning for a third or greater spawning, originally mature as a 1SW (1AR) or 2SW (2AR) with a second spawning as an alternate
3R	previous spawner, originally matured as a 3SW with either consecutive or alternate previous spawning history

Table 3. Catch of Atlantic salmon by location, size group and year, relative to the estimated total returns of Atlantic salmon to the Margaree River, 1987 to 1996. Estimated returns are from Marshall et al. (1997).

Year	Size Group	Location				Grand Total	Estimated Returns	Catch as % of Returns
		Lower	Upper	Island	Levis			
1987	Small	27	-	-	-	27	1478	2%
	Large	117	-	-	-	117	4015	3%
1988	Small	108	97	-	-	205	2209	9%
	Large	99	68	-	-	167	1688	10%
1989	Small	41	39	-	-	80	768	10%
	Large	184	165	-	-	349	2289	15%
1990	Small	71	94	-	-	165	1977	8%
	Large	135	162	-	-	297	5156	6%
1991	Small	-	37	-	133	170	1909	9%
	Large	-	42	-	161	203	3484	6%
1992	Small	-	70	-	164	234	1645	14%
	Large	-	277	-	602	879	6375	14%
1993	Small	-	-	88	166	254	2087	12%
	Large	-	-	122	261	383	3358	11%
1994	Small	-	-	-	113	113	708	16%
	Large	-	-	-	463	463	2900	16%
1995	Small	-	-	-	132	132	737	18%
	Large	-	-	-	405	405	2365	17%
1996	Small	-	-	-	304	304	1685	18%
	Large	-	-	-	487	487	2792	17%
Total	Small	247	337	88	1012	1684		
	Large	535	714	122	2379	3750		

Ticks (-) indicate facility not in operation.

Table 4. Number of wild and hatchery origin Atlantic salmon captured at the Margaree River estuary trapnets, 1987 to 1996.

	Summer				Fall				Combined			
Year	Wild	Hatchery	Total	Prop. Wild	Wild	Hatchery	Total	Prop. Wild	Wild	Hatchery	Total	Prop. Wild
Small salmon												
1987	6	7	13	0.46	11	3	14	0.79	17	10	27	0.63
1988	18	0	18	1.00	185	2	187	0.99	203	2	205	0.99
1989	3	1	4	0.75	73	3	76	0.96	76	4	80	0.95
1990	3	4	7	0.43	152	6	158	0.96	155	10	165	0.94
1991	138	32	170	0.81	-	-	-	-	138	32	170	0.81
1992	31	23	54	0.57	154	26	180	0.86	185	49	234	0.79
1993	95	82	177	0.54	74	3	77	0.96	169	85	254	0.67
1994	49	18	67	0.73	41	5	46	0.89	90	23	113	0.80
1995	38	8	46	0.83	80	6	86	0.93	118	14	132	0.89
1996	144	41	185	0.78	115	4	119	0.97	259	45	304	0.85
Total	525	216	741	0.71	885	58	943	0.94	1410	274	1684	0.84
Large salmon												
1987	17	0	17	1.00	95	5	100	0.95	112	5	117	0.96
1988	2	1	3	0.67	163	1	164	0.99	165	2	167	0.99
1989	7	0	7	1.00	323	19	342	0.94	330	19	349	0.95
1990	7	6	13	0.54	272	12	284	0.96	279	18	297	0.94
1991	184	19	203	0.91	-	-	-	-	184	19	203	0.91
1992	118	16	134	0.88	719	26	745	0.97	837	42	879	0.95
1993	186	19	205	0.91	172	6	178	0.97	358	25	383	0.93
1994	156	24	180	0.87	273	10	283	0.96	429	34	463	0.93
1995	101	15	116	0.87	283	6	289	0.98	384	21	405	0.95
1996	221	19	240	0.92	237	10	247	0.96	458	29	487	0.94
Total	999	119	1118	0.89	2537	95	2632	0.96	3536	214	3750	0.94

Table 5. Numbers of wild Atlantic salmon, by spawning history and season of return to the Margaree River, all years combined.

	Spawning History	Summer	Fall	Total
Maiden	1SW	524	878	1402
	2SW	750	2048	2798
	3SW	19	151	170
Repeat Spawners	1C	0	11	11
	1A	9	11	20
	2C	7	67	74
	2A	36	112	148
	2CC	2	3	5
	2AC	5	13	18
	2AA	4	16	20
	2CAA	0	1	1
	2ACA	1	0	1
	2ACC	0	4	4
	2AAC	1	0	1
	2AAA	2	1	3
	3C	3	18	21
	3A	2	21	23
	3CC	0	3	3
	3AA	0	1	1
	3AC	0	3	3
	3CCC	0	1	1
	Unknown	159	59	218
	Prop. Maiden	0.95	0.91	0.92
	Prop. of repeat spawners which are alternate spawners on second migration	0.83	0.64	0.68
	Total	1524	3422	4946

Table 6. Sea-age spawning histories of wild Atlantic salmon within size groups from the Margaree River, 1987 to 1996.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Small salmon										
1SW	17	195	75	151	137	178	168	87	118	254
1C	1	0	0	0	0	1	0	0	0	0
2SW	0	0	0	1	0	0	0	0	0	0
Unknown	0	1	1	2	1	1	0	0	0	0
Total	18	196	76	154	138	180	168	87	118	254
Prop. maiden	0.94	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
Large salmon										
1SW	0	6	0	2	0	5	1	3	0	5
2SW	91	126	270	203	160	703	295	319	284	346
3SW	11	2	21	36	3	46	15	12	14	10
1C	0	0	1	1	0	5	1	1	0	0
1A	1	0	0	2	5	7	3	1	0	1
2C	2	17	27	0	1	6	1	5	10	5
2A	3	6	6	18	7	23	17	27	12	29
2CR	0	2	0	0	0	0	1	0	1	2
2AR	1	0	0	4	3	11	8	7	7	6
3R	0	3	4	10	3	10	7	5	4	6
Unknown	2	9	1	4	2	12	7	52	52	53
Total	111	171	330	280	184	828	356	432	384	463
Prop. maiden	0.94	0.83	0.88	0.87	0.90	0.92	0.89	0.88	0.90	0.88
Small & large combined										
1SW	17	201	75	153	137	183	169	90	118	259
2SW	91	126	270	204	160	703	295	319	284	346
3SW	11	2	21	36	3	46	15	12	14	10
Repeat spawners	8	28	38	35	19	63	38	46	34	49
Unknown	2	11	2	6	3	27	10	52	52	53
Grand total	129	368	406	434	322	1022	527	519	502	717
Prop. Maiden	0.94	0.92	0.91	0.92	0.94	0.94	0.93	0.90	0.92	0.93

Table 7. Sea-age spawning histories of wild Atlantic salmon by season of return, size groups combined, from the Margaree River, 1987 to 1996.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	All years
Summer											
1SW	6	18	3	3	137	31	95	49	38	144	524
2SW	15	2	6	6	160	98	166	97	48	152	750
3SW	2	0	0	0	3	7	3	2	1	1	19
1A	0	0	0	0	5	2	2	0	0	0	9
2C	0	0	0	0	1	0	1	1	3	1	7
2A	0	0	0	0	7	6	7	3	0	13	36
2CC	0	0	0	0	0	0	0	0	0	2	2
2AC	0	0	0	0	1	0	1	1	1	1	5
2AA	0	0	0	1	1	0	1	0	0	1	4
2ACA	0	0	0	0	1	0	0	0	0	0	1
2AAC	0	0	0	0	0	0	1	0	0	0	1
2AAA	0	0	0	0	0	0	1	1	0	0	2
3C	0	0	1	0	1	0	0	1	0	0	3
3A	0	0	0	0	2	0	0	0	0	0	2
Unknown	0	0	0	0	3	5	3	50	48	50	159
Total	23	20	10	10	322	149	281	205	139	365	1524
Prop. repeat spawners	0.00	0.00	0.10	0.10	0.06	0.06	0.05	0.05	0.04	0.06	0.05
Prop. maiden	1.00	1.00	0.90	0.90	0.94	0.94	0.95	0.95	0.96	0.94	0.95
Fall											
1SW	11	183	72	150	-	152	74	41	80	115	878
2SW	76	124	264	198	-	605	129	222	236	194	2048
3SW	9	2	21	36	-	39	12	10	13	9	151
1C	1	0	1	1	-	6	1	1	0	0	11
1A	1	0	0	2	-	5	1	1	0	1	11
2C	2	17	27	0	-	6	0	4	7	4	67
2A	3	6	6	18	-	17	10	24	12	16	112
2CC	0	2	0	0	-	0	0	0	1	0	3
2AC	1	0	0	2	-	3	1	2	2	2	13
2AA	0	0	0	1	-	7	2	2	2	2	16
2CAA	0	0	0	0	-	0	1	0	0	0	1
2ACC	0	0	0	0	-	1	0	1	2	0	4
2AAA	0	0	0	0	-	0	1	0	0	0	1
3C	0	2	2	5	-	2	1	0	3	3	18
3A	0	1	0	3	-	7	4	3	1	2	21
3CC	0	0	0	0	-	0	2	0	0	1	3
3AA	0	0	0	1	-	0	0	0	0	0	1
3AC	0	0	1	1	-	1	0	0	0	0	3
3CCCC	0	0	0	0	-	0	0	1	0	0	1
Unknown	2	11	2	6	-	22	7	2	4	3	59
Total	106	348	396	424	-	873	246	314	363	352	3422
Prop. repeat spawners	0.08	0.08	0.09	0.08	0.06	0.06	0.10	0.13	0.08	0.09	0.09
Prop. maiden	0.92	0.92	0.91	0.92	0.94	0.94	0.90	0.88	0.92	0.91	0.91
Summer & Fall Combined											
1SW	17	201	75	153	137	183	169	90	118	259	1402
2SW	91	126	270	204	160	703	295	319	284	346	2798
3SW	11	2	21	36	3	46	15	12	14	10	170
1C	1	0	1	1	0	6	1	1	0	0	11
1A	1	0	0	2	5	7	3	1	0	1	20
2C	2	17	27	0	1	6	1	5	10	5	74
2A	3	6	6	18	7	23	17	27	12	29	148
2CR	0	2	0	0	0	0	1	0	1	2	6
2AR	1	0	0	4	3	11	8	7	7	6	47
3R	0	3	4	10	3	10	7	5	4	6	52
Unknown	2	11	2	6	3	27	10	52	52	53	218
Total	129	368	406	434	322	1022	527	519	502	717	4946
Prop. 1SW	0.13	0.56	0.19	0.36	0.43	0.18	0.33	0.19	0.26	0.39	0.30
Prop. 2SW	0.72	0.35	0.67	0.48	0.50	0.71	0.57	0.68	0.63	0.52	0.59
Prop. 3SW	0.09	0.01	0.05	0.08	0.01	0.05	0.03	0.03	0.03	0.02	0.04
Prop. repeat spawners	0.06	0.08	0.09	0.08	0.06	0.06	0.07	0.10	0.08	0.07	0.08
Prop. maiden	0.94	0.92	0.91	0.92	0.94	0.94	0.93	0.90	0.92	0.93	0.92

Table 8. Freshwater age (years) distribution of wild maiden Atlantic salmon catches from the Margaree River within the summer and fall seasons, 1987 to 1996.

	Fresh water	1SW			2SW			3SW		
Year	age	Summer	Fall	Total	Summer	Fall	Total	Summer	Fall	Total
1987	2	1	7	8	10	42	52	2	3	5
	3	3	4	7	4	23	27	.	2	2
	4	.	.	.	.	1	1	.	.	
1988	2	11	115	126	2	96	98	.	2	2
	3	5	42	47	.	18	18	.	.	
	4	.	2	2	.	1	1	.	.	
1989	2	1	37	38	4	144	148	.	14	14
	3	2	29	31	2	91	93	.	3	3
	4	.	.		.	1	1	.	.	
1990	2	3	79	82	4	115	119	.	21	21
	3	.	45	45	2	46	48	.	6	6
	4	.	.		.	4	4	.	.	
1991	2	57	.	57	82	.	82	3	.	3
	3	49	.	49	48	.	48	.	.	
	4	2	.	2	1	.	1	.	.	
1992	2	15	85	100	40	271	311	6	31	37
	3	6	44	50	41	201	242	.	4	4
	4	5	5	10	1	4	5	.	.	
1993	2	40	33	73	72	72	144	.	3	3
	3	31	24	55	69	33	102	2	6	8
	4	8	3	11	2	2	4	.	.	
	5	1	.	1	.	.		.	.	
1994	2	2	9	11	45	128	173	2	6	8
	3	9	15	24	43	83	126	.	2	2
	4	1	.	1	1	.	1	.	.	
1995	2	1	11	12	28	147	175	.	9	9
	3	.	7	7	14	54	68	1	2	3
	4	.	.		1	2	3	.	.	
1996	2	49	55	104	64	110	174	.	4	4
	3	24	38	62	53	47	100	.	3	3
	4	2	2	4	1	1	2	.	1	1
All years combined	2	180	431	611	351	1125	1476	13	93	106
	3	129	248	377	276	596	872	3	28	31
	4	18	12	30	7	16	23	0	1	1
	5	1	0	1	0	0	0	0	0	0
	Total	328	691	1019	634	1737	2371	16	122	138
Prop. by fresh water age all years	2	0.55	0.62	0.60	0.55	0.65	0.62	0.81	0.76	0.77
	3	0.39	0.36	0.37	0.44	0.34	0.37	0.19	0.23	0.22
	4	0.06	0.02	0.03	0.01	0.01	0.01	0.00	0.01	0.01
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9. Freshwater age (years) distribution of wild repeat-spawning Atlantic salmon from the Margaree River within the summer and fall seasons, 1987 to 1996.

	Fresh water	1C		1A			2C;2CR		2A;2AR			3R		
Year	age	Summer	Fall	Summer	Fall	Total	Summer	Fall	Summer	Fall	Total	Summer	Fall	Total
1987	2	.	.	.	.	.	.	1	.	2	3	.	.	0
	3	.	1	.	.	1	.	1	.	.	1	.	.	.
1988	2	.	.	.	.	.	.	10	.	5	15	.	2	2
	3	.	.	.	.	.	.	3	.	.	3	.	.	.
1989	2	.	.	.	.	.	.	17	.	4	21	1	2	3
	3	.	1	.	.	1	.	7	.	2	9	.	. .	
1990	2	.	1	.	.	1	.	.	1	16	17	.	7	7
	3	.	.	.	1	1	.	.	.	2	2	.	1	1
1991	2	.	.	2	.	2	.	.	6	.	6	.	.	.
	3	.	.	2	.	2	.	.	3	.	3	.	.	.
1992	2	.	5	1	2	8	.	4	4	20	28	.	7	7
	3	.	1	.	3	4	.	3	1	5	9	.	1	1
	4	.	.	1	.	1	.	.	.	.	.	.	.	.
1993	2	.	.	1	1	2	.	1	7	8	16	.	3	3
	3	.	.	.	.	.	.	.	4	4	8	.	3	3
1994	2	.	.	.	1	1	1	2	2	11	16	1	3	4
	3	.	1	.	.	1	.	1	2	15	18	.	. .	
	4	.	.	.	.	.	.	.	.	1	1	.	. .	
1995	2	.	.	.	.	.	1	5	.	16	22	.	4	4
	3	.	.	.	.	.	.	2	1	2	5	.	. .	
	4	.	.	.	.	.	1	.	.	.	1	.	.	.
1996	2	.	.	.	.	.	.	3	7	9	19	.	4	4
	3	.	.	.	1	1	1	1	4	8	14	.	2	2
All years combined	2	0	6	4	4	14	2	43	27	91	163	2	32	34
	3	0	4	2	5	11	1	18	15	38	72	0	7	7
	4	0	0	1	0	1	1	0	0	1	2	0	0	0
	Total	0	10	7	9	26	4	61	42	130	237	2	39	41
Prop. by fresh water age all years	2	0.00	0.60	0.57	0.44	0.54	0.50	0.70	0.64	0.70	0.69	1.00	0.82	0.83
	3	0.00	0.40	0.29	0.56	0.42	0.25	0.30	0.36	0.29	0.30	0.00	0.18	0.17
	4	0.00	0.00	0.14	0.00	0.04	0.25	0.00	0.00	0.01	0.01	0.00	0.00	0.00

Table 10. Maximum, minimum, and mean fork length (cm) of wild maiden 1SW, 2SW and 3SW Atlantic salmon from the Margaree River based on samples collected at the estuary trapnets, 1987 to 1996.

Summer

	1SW				Maiden 2SW				Maiden 3SW			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	58.0	49.0	52.8	6	82.0	70.0	74.8	15	89.0	74.0	81.5	2
1988	61.5	50.5	55.9	18	77.0	73.0	75.0	2	.	.	.	.
1989	57.0	54.5	55.8	3	79.5	70.5	75.0	6	.	.	.	.
1990	55.5	48.0	51.8	3	78.5	68.0	72.4	6	.	.	.	.
1991	60.5	44.5	52.7	137	83.0	66.0	72.9	160	90.5	84.0	87.8	3
1992	61.0	47.0	55.1	31	81.0	69.5	74.5	98	90.0	83.0	87.6	7
1993	60.0	47.5	53.8	95	83.0	64.0	74.6	166	92.3	86.7	89.6	3
1994	66.3	44.8	56.1	49	86.7	67.9	74.9	97	93.8	89.6	91.7	2
1995	60.0	41.0	53.0	38	87.8	67.0	74.3	48	92.0	92.0	92.0	1
1996	62.5	49.0	54.6	144	93.5	66.5	74.6	152	82.5	82.5	82.5	1
Mean	60.2	47.6	54.2	524	83.2	68.2	74.3	750	90.0	84.5	87.5	19

Fall

	1SW				Maiden 2SW				Maiden 3SW			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	58.0	51.0	54.5	11	86.0	67.0	76.4	76	100.0	80.0	90.7	9
1988	64.5	48.5	56.1	183	90.0	68.0	76.6	124	88.5	88.0	88.3	2
1989	62.5	48.5	56.0	72	85.0	64.5	75.5	264	104.0	85.5	91.3	21
1990	64.0	50.5	56.6	150	85.5	62.5	75.7	198	95.0	81.0	87.8	36
1991	.	.	.	.	.	.	.	.	.	.	.	.
1992	65.9	47.3	57.0	152	92.5	66.0	75.8	605	95.0	80.5	87.7	39
1993	63.5	49.5	56.0	74	84.5	68.0	76.1	129	93.5	82.5	88.8	12
1994	63.0	51.0	57.2	41	85.5	66.5	76.5	222	96.5	82.8	89.6	10
1995	62.4	50.5	55.0	80	87.7	66.0	75.7	236	96.0	85.9	89.9	13
1996	65.3	49.2	57.0	115	89.5	66.5	76.4	194	94.0	87.5	90.0	9
Mean	63.2	49.6	56.2	878	87.4	66.1	76.1	2048	95.8	83.7	89.3	151

Combined

	1SW				Maiden 2SW				Maiden 3SW			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	58.0	49.0	53.9	17	86.0	67.0	76.1	91	100.0	74.0	89.0	11
1988	64.5	48.5	56.1	201	90.0	68.0	76.6	126	88.5	88.0	88.3	2
1989	62.5	48.5	56.0	75	85.0	64.5	75.5	270	104.0	85.5	91.3	21
1990	64.0	48.0	56.5	153	85.5	62.5	75.6	204	95.0	81.0	87.8	36
1991	60.5	44.5	52.7	137	83.0	66.0	72.9	160	90.5	84.0	87.8	3
1992	65.9	47.0	56.7	183	92.5	66.0	75.7	703	95.0	80.5	87.7	46
1993	63.5	47.5	54.7	169	84.5	64.0	75.2	295	93.5	82.5	88.9	15
1994	66.3	44.8	56.6	90	86.7	66.5	76.0	319	96.5	82.8	89.9	12
1995	62.4	41.0	54.4	118	87.8	66.0	75.4	284	96.0	85.9	90.1	14
1996	65.3	49.0	55.7	259	93.5	66.5	75.6	346	94.0	82.5	89.3	10
Mean	63.3	46.8	55.3	1402	87.5	65.7	75.5	2798	95.3	82.7	89.0	170

Table 11. Maximum, minimum, and mean fork length (cm) of wild repeat-spawning Atlantic salmon from the Margaree River based on samples collected at the estuary trapnets, 1987 to 1996.

Summer

	1A				1C				2A				2C			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1988	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1989	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1990	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1991	80.5	69.5	75.3	5	.	.	.	.	91.5	86.5	88.2	7	77.0	77.0	77.0	1
1992	73.5	65.0	69.3	2	.	.	.	.	96.0	85.5	92.4	6	.	.	.	.
1993	77.9	74.2	76.1	2	.	.	.	.	93.0	85.0	88.9	7	83.5	83.5	83.5	1
1994	.	.	.	.	.	.	.	.	96.0	89.8	93.4	3	82.2	82.5	82.5	1
1995	.	.	.	.	.	.	.	.	.	.	.	.	90.0	81.5	85.8	3
1996	.	.	.	.	.	.	.	.	97.5	82.3	91.1	13	77.8	77.8	77.8	1
Mean	77.3	69.6	73.6	9	.	.	.	0	94.8	85.8	90.8	36	82.1	80.5	81.3	7

Fall

	1A				1C				2A				2C			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	78.0	78.0	78.0	1	60.0	60.0	60.0	1	92.0	90.0	91.3	3	81.0	79.0	80.0	2
1988	.	.	.	.	.	.	.	.	100.0	92.0	95.8	6	97.5	83.0	91.2	17
1989	.	.	.	.	67.0	67.0	67.0	1	96.0	90.0	93.3	6	104.0	88.5	95.7	27
1990	92.0	82.0	87.0	2	69.0	69.0	69.0	1	96.0	89.0	93.8	18	.	.	.	.
1991	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1992	89.5	70.0	83.6	5	71.2	62.0	67.4	6	100.0	87.5	93.5	17	88.5	77.5	83.6	6
1993	84.0	84.0	84.0	1	69.0	69.0	69.0	1	97.0	88.0	93.0	10	.	.	.	.
1994	87.3	87.3	87.3	1	65.0	65.0	65.0	1	97.0	85.0	92.1	24	90.5	76.5	83.1	4
1995	.	.	.	.	.	.	.	.	96.5	86.5	92.3	12	87.0	78.6	83.6	7
1996	82.2	82.2	82.2	1	.	.	.	.	98.0	80.1	92.5	16	86.2	75.6	81.8	4
Mean	85.5	80.6	83.7	11	66.9	65.3	66.2	11	96.9	87.6	93.1	112	90.7	79.8	85.6	67

Combined

	1A				1C				2A				2C			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	78.0	78.0	78.0	1	60.0	60.0	60.0	1	92.0	90.5	91.3	3	81.0	79.0	80.0	2
1988	.	.	.	.	.	.	.	.	100.0	92.0	95.8	6	97.5	83.0	91.2	17
1989	.	.	.	.	67.0	67.0	67.0	1	96.0	90.0	93.3	6	104.0	88.5	95.7	27
1990	92.0	82.0	87.0	2	69.0	69.0	69.0	1	96.0	89.0	93.8	18	.	.	.	.
1991	80.5	69.5	75.3	5	.	.	.	.	91.5	86.5	88.2	7	77.0	77.0	77.0	1
1992	89.5	65.0	79.5	7	71.2	62.0	67.4	6	100.0	85.5	93.2	23	88.5	77.5	83.6	6
1993	84.0	74.2	78.7	3	69.0	69.0	69.0	1	97.0	85.0	91.3	17	83.5	83.5	83.5	1
1994	87.3	87.3	87.3	1	65.0	65.0	65.0	1	97.0	85.0	92.2	27	90.5	76.5	83.0	5
1995	.	.	.	.	.	.	.	.	96.5	86.5	92.3	12	90.0	78.6	84.3	10
1996	82.0	82.0	82.0	1	.	.	.	.	98.0	80.1	91.8	29	86.2	75.6	81.0	5
Mean	84.8	76.9	81.1	20	66.9	65.3	66.2	11	96.4	87.0	92.3	148	88.7	79.9	84.4	74

Table 12. Number of male and female wild maiden 1SW, 2SW and 3SW Atlantic salmon from the Margaree River based on samples collected after August 31, 1987 to 1996.

Maiden 1SW

Year	Male	Female	Total	Prop. Female
1987	4	1	5	0.20
1988	93	26	119	0.22
1989	39	30	69	0.43
1990	115	33	148	0.22
1991	.	.	.	.
1992	133	10	143	0.07
1993	62	9	71	0.13
1994	32	6	38	0.16
1995	75	5	80	0.06
1996	109	5	114	0.04
Total	662	125	787	0.16

Maiden 2SW

Year	Male	Female	Total	Prop. Female
1987	27	35	62	0.56
1988	28	82	110	0.75
1989	77	186	263	0.71
1990	68	130	198	0.66
1991	.	.	.	.
1992	151	454	605	0.75
1993	37	91	128	0.71
1994	47	172	219	0.79
1995	70	164	234	0.70
1996	58	135	193	0.70
Total	563	1449	2012	0.72

Maiden 3SW

Year	Male	Female	Total	Prop. Female
1987	0	9	9	1.00
1988	0	2	2	1.00
1989	1	20	21	0.95
1990	7	29	36	0.81
1991	.	.	.	.
1992	6	33	39	0.85
1993	1	11	12	0.92
1994		10	10	1.00
1995	0	12	12	1.00
1996	2	7	9	0.78
Total	17	133	150	0.89

Table 13. Number of male and female wild repeat-spawning 1SW, 2SW and 3SW Atlantic salmon from the Margaree River based on samples collected after August 31, 1987 to 1996.

1A

Year	Male	Female	Total	Prop. Female
1987	0	1	1	1.00
1988	.	.	.	.
1989	.	.	.	.
1990	1	1	2	0.50
1991	.	.	.	.
1992	4	1	5	0.20
1993	1	0	1	0.00
1994	1	0	1	0.00
1995	.	.	.	.
1996	1	0	1	0.00
Total	8	3	11	0.27

1C

Year	Male	Female	Total	Prop. Female
1987	1	0	1	0.00
1988	.	.	.	.
1989	0	1	1	1.00
1990	1	0	1	0.00
1991	.	.	.	.
1992	5	1	6	0.17
1993	1	0	1	0.00
1994	1	0	1	0.00
1995	.	.	.	.
1996	.	.	.	.
Total	9	2	11	0.18

2A

Year	Male	Female	Total	Prop. Female
1987	0	3	3	1.00
1988	2	4	6	0.67
1989	1	5	6	0.83
1990	2	16	18	0.89
1991	.	.	.	.
1992	3	14	17	0.82
1993	0	10	10	1.00
1994	1	23	24	0.96
1995	1	11	12	0.92
1996	2	14	16	0.88
Total	12	100	112	0.89

2C

Year	Male	Female	Total	Prop. Female
1987	0	2	2	1.00
1988	1	14	15	0.93
1989	1	26	27	0.96
1990	.	.	.	.
1991			.	.
1992	1	5	6	0.83
1993	.	.	.	.
1994	2	2	4	0.50
1995	1	6	7	0.86
1996	1	3	4	0.75
Total	7	58	65	0.89

3A

Year	Male	Female	Total	Prop. Female
1987	.	.	.	.
1988	0	1	1	1.00
1989	.	.	.	.
1990	1	2	3	0.67
1991	.	.	.	.
1992	0	7	7	1.00
1993	0	4	4	1.00
1994	0	3	3	1.00
1995	0	1	1	1.00
1996	0	2	2	1.00
Total	1	20	21	0.95

3C

Year	Male	Female	Total	Prop. Female
1987	.	.	.	.
1988	0	2	2	1.00
1989	0	2	2	1.00
1990	0	5	5	1.00
1991			.	.
1992	0	2	2	1.00
1993	1	0	1	0.00
1994	.	.	.	.
1995	0	3	3	1.00
1996	0	3	3	1.00
Total	1	17	18	0.94

Table 14. Freshwater age distribution of hatchery origin Atlantic salmon by sea-age and year of sampling from the Margaree River, 1987 to 1996.

		Fresh water age (years)				
	Year	1	2	3	4	Total
1SW						
	1987	.	6	.	.	6
	1988	.	1	.	.	1
	1989	.	1	2	.	3
	1990	.	9	.	.	9
	1991	.	13	.	.	13
	1992	1	31	.	.	32
	1993	.	51	1	1	53
	1994	3	17	1	.	21
	1995	.	8	.	.	8
	1996	1	27	4	.	32
	All years combined	5	164	8	1	178
	Proportion at age	0.03	0.92	0.04	0.01	.
2SW						
	1987	.	2	1	.	3
	1988	.	1	1	.	2
	1989	.	2	5	.	7
	1990	.	12	2	.	14
	1991	1	11	2	.	14
	1992	.	12	4	.	16
	1993	1	13	3	.	17
	1994	2	25	2	.	29
	1995	.	11	4	.	15
	1996	.	18	2	.	20
	All years combined	4	107	26	.	137
	Proportion at age	0.03	0.78	0.19	.	.
3SW						
	1987	.	.	.	.	0
	1988	.	.	.	.	0
	1989	.	.	.	.	0
	1990	.	2	.	.	2
	1991	.	1	.	.	1
	1992	.	.	.	.	0
	1993	.	.	.	.	0
	1994	.	.	.	.	0
	1995	.	.	.	.	0
	1996	.	.	.	.	0
	All years combined	.	3	.	.	3
	Proportion at age	.	1.00	.	.	.

Table 15. Maximum, minimum, and mean fork length (cm) of hatchery origin maiden 1SW, 2SW and 3SW Atlantic salmon from the Margaree River based on samples collected at the estuary trapnets, 1987 to 1996.

Summer

	1SW				Maiden 2SW				Maiden 3SW			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	59.0	48.0	52.5	6	.	.	.	.	.	.	.	.
1988	.	.	.	.	78.0	78.0	78.0	1	.	.	.	.
1989	54.0	54.0	54.0	1	.	.	.	.	.	.	.	.
1990	58.0	52.5	55.1	4	76.5	66.0	71.7	6	.	.	.	.
1991	57.0	47.0	52.0	32	82.0	67.0	73.9	17	81.5	81.5	81.5	1
1992	58.9	50.3	54.8	22	78.5	66.0	74.8	12	.	.	.	.
1993	58.8	46.6	53.1	80	76.0	66.0	72.1	18	.	.	.	.
1994	62.7	53.1	57.3	18	80.7	69.5	75.1	22	.	.	.	.
1995	58.0	50.0	53.6	6	78.0	66.0	72.1	15	.	.	.	.
1996	61.3	49.5	54.6	35	78.0	68.0	73.7	17	.	.	.	.
Mean	58.6	50.1	54.1	204	78.5	68.3	73.9	108	81.5	81.5	81.5	1

Fall

	1SW				Maiden 2SW				Maiden 3SW			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	57.0	55.0	56.0	2	90.0	74.0	79.4	5	.	.	.	.
1988	60.0	58.5	59.3	2	78.0	78.0	78.0	1	.	.	.	.
1989	59.5	56.0	57.7	3	81.5	71.5	75.6	17	.	.	.	.
1990	65.0	54.5	58.4	6	86.0	66.0	72.2	9	91.0	85.0	88.0	2
1991	.	.	.	.	.	.	.	.	.	.	.	.
1992	62.3	52.0	56.1	22	83.0	65.8	76.1	14	.	.	.	.
1993	59.5	51.5	55.3	3	77.2	69.5	73.9	3	.	.	.	.
1994	60.0	57.8	58.8	5	79.0	66.4	75.6	10	.	.	.	.
1995	63.4	53.0	57.2	5	84.1	72.5	77.3	6	.	.	.	.
1996	59.8	55.5	57.6	4	79.0	68.9	74.9	8	.	.	.	.
Mean	60.7	54.9	57.4	52	82.0	70.3	75.9	73	91.0	85.0	88.0	2

Combined

	1SW				Maiden 2SW				Maiden 3SW			
Year	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N
1987	59.0	48.0	53.4	8	90.0	74.0	79.4	5	.	.	.	.
1988	60.0	58.5	59.3	2	78.0	78.0	78.0	2	.	.	.	.
1989	59.5	54.0	56.8	4	81.5	71.5	75.6	17	.	.	.	.
1990	65.0	52.5	57.1	10	86.0	66.0	72.0	15	91.0	85.0	88.0	2
1991	57.0	47.0	52.0	32	82.0	67.0	73.9	17	81.5	81.5	81.5	1
1992	62.3	50.3	55.5	44	83.0	65.8	75.5	26	.	.	.	.
1993	59.5	46.6	53.2	83	77.2	66.0	72.4	21	.	.	.	.
1994	62.7	53.1	57.6	23	80.7	66.4	75.2	32	.	.	.	.
1995	63.4	50.0	55.2	11	84.1	66.0	73.6	21	.	.	.	.
1996	61.3	49.5	54.9	39	79.0	68.0	74.1	25	.	.	.	.
Mean	61.0	51.0	55.5	256	82.2	68.9	75.0	181	86.3	83.3	84.8	3

Table 16. Number of male and female hatchery origin maiden Atlantic salmon from the Margaree River based on samples collected at the estuary trapnets after August 31, 1987 to 1996.

Maiden 1SW

Year	Male	Female	Total	Prop. Female
1987	0	0	0	.
1988	2	0	2	0.00
1989	1	2	3	0.67
1990	3	3	6	0.50
1991	.	.	.	.
1992	17	3	20	0.15
1993	3	0	3	0.00
1994	4	0	4	0.00
1995	5	0	5	0.00
1996	3	0	3	0.00
Total	38	8	46	0.17

Maiden 2SW

Year	Male	Female	Total	Prop. Female
1987	1	1	2	0.50
1988	0	1	1	1.00
1989	9	8	17	0.47
1990	6	3	9	0.33
1991	.	.	.	.
1992	6	8	14	0.57
1993	2	1	3	0.33
1994	2	8	10	0.80
1995	3	2	5	0.40
1996	2	6	8	0.75
Total	31	38	69	0.55

Maiden 3SW

Year	Male	Female	Total	Prop. Female
1987	.	.	.	.
1988	.	.	.	.
1989	.	.	.	.
1990	0	2	2	1.00
1991	.	.	.	.
1992	.	.	.	.
1993	.	.	.	.
1994	.	.	.	.
1995	.	.	.	.
1996	.	.	.	.
Total	0	2	2	1.00

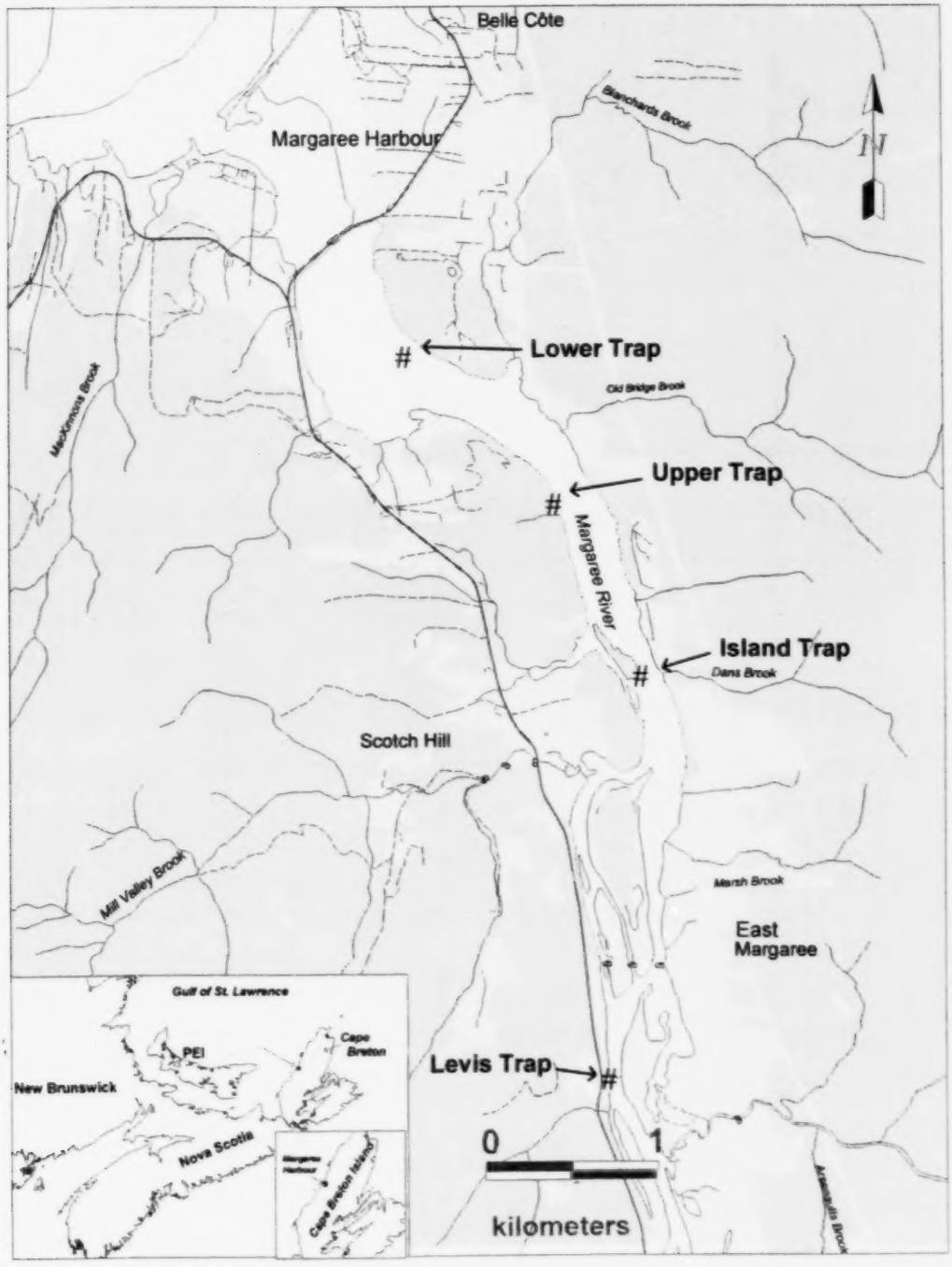


Figure 1. The Margaree River and locations of the estuarine trapnets.

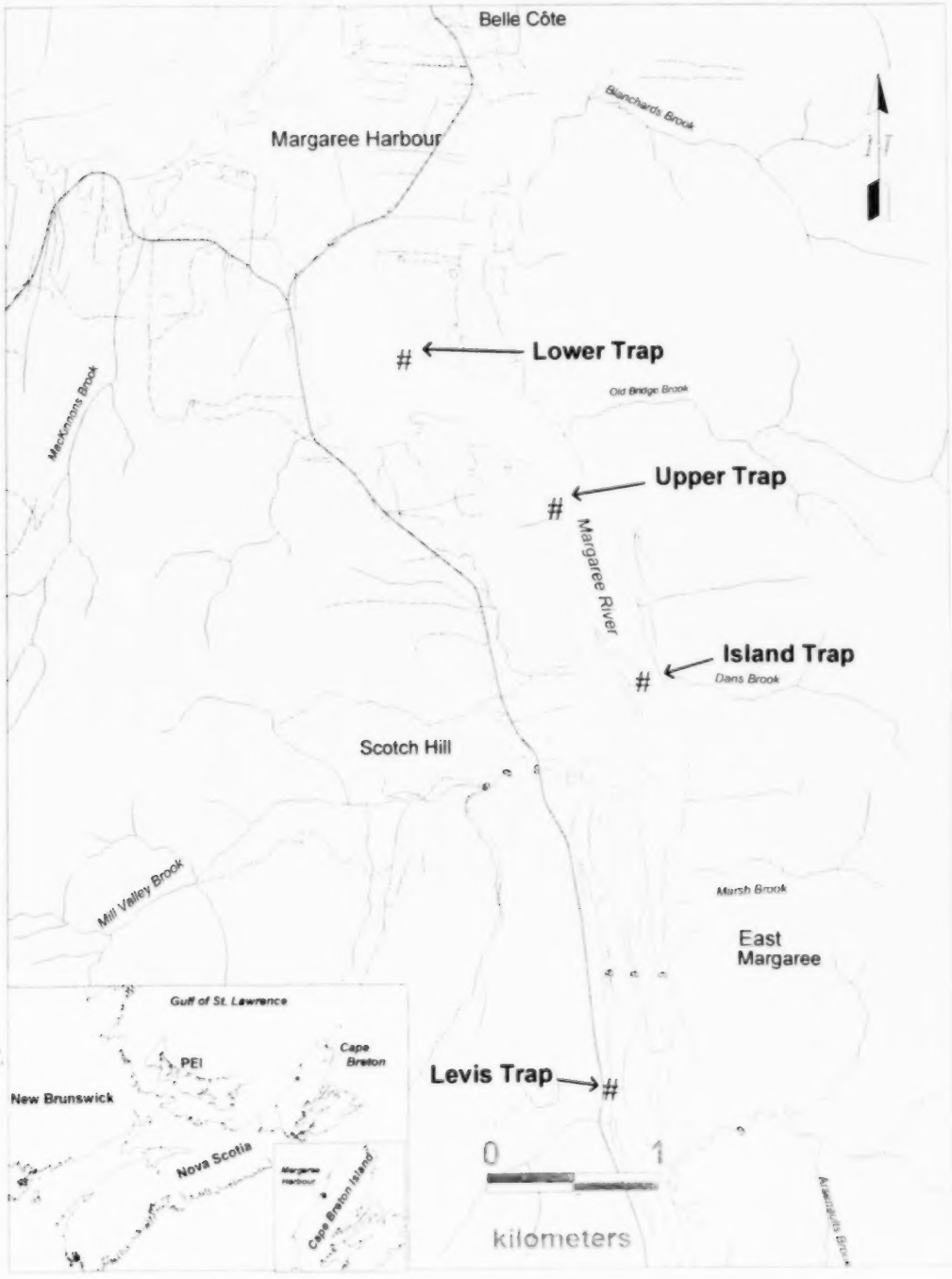


Figure 1. The Margaree River and locations of the estuarine trapnets.

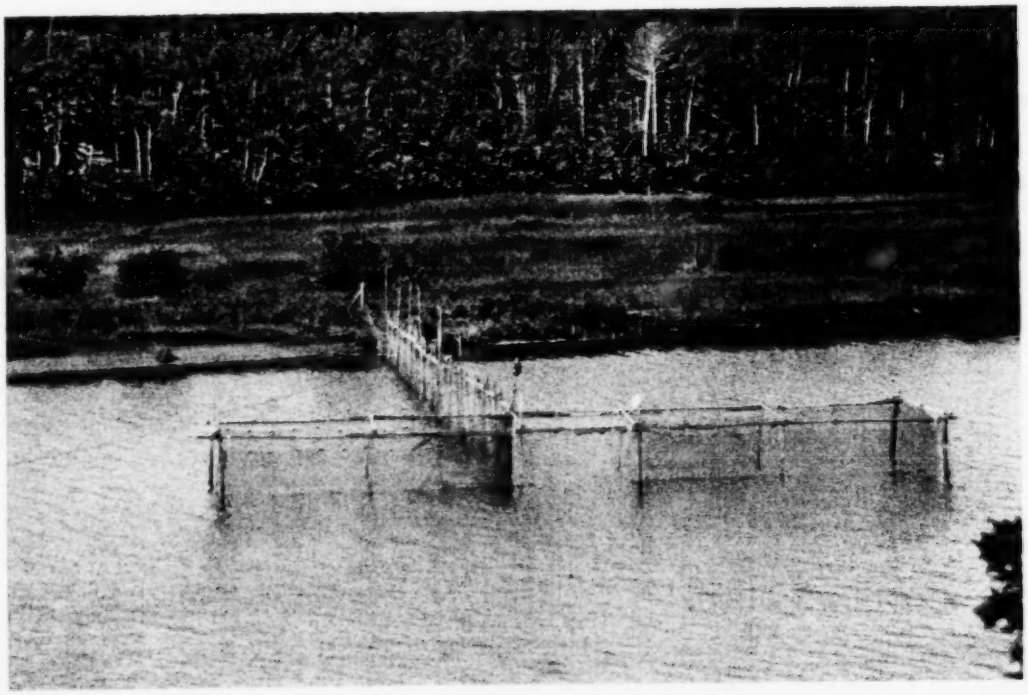


Figure 2. Example of a T-trap design trapnet (Island trapnet).

Figure 3. Example of a V-trap design trapnet (Levis trapnet)

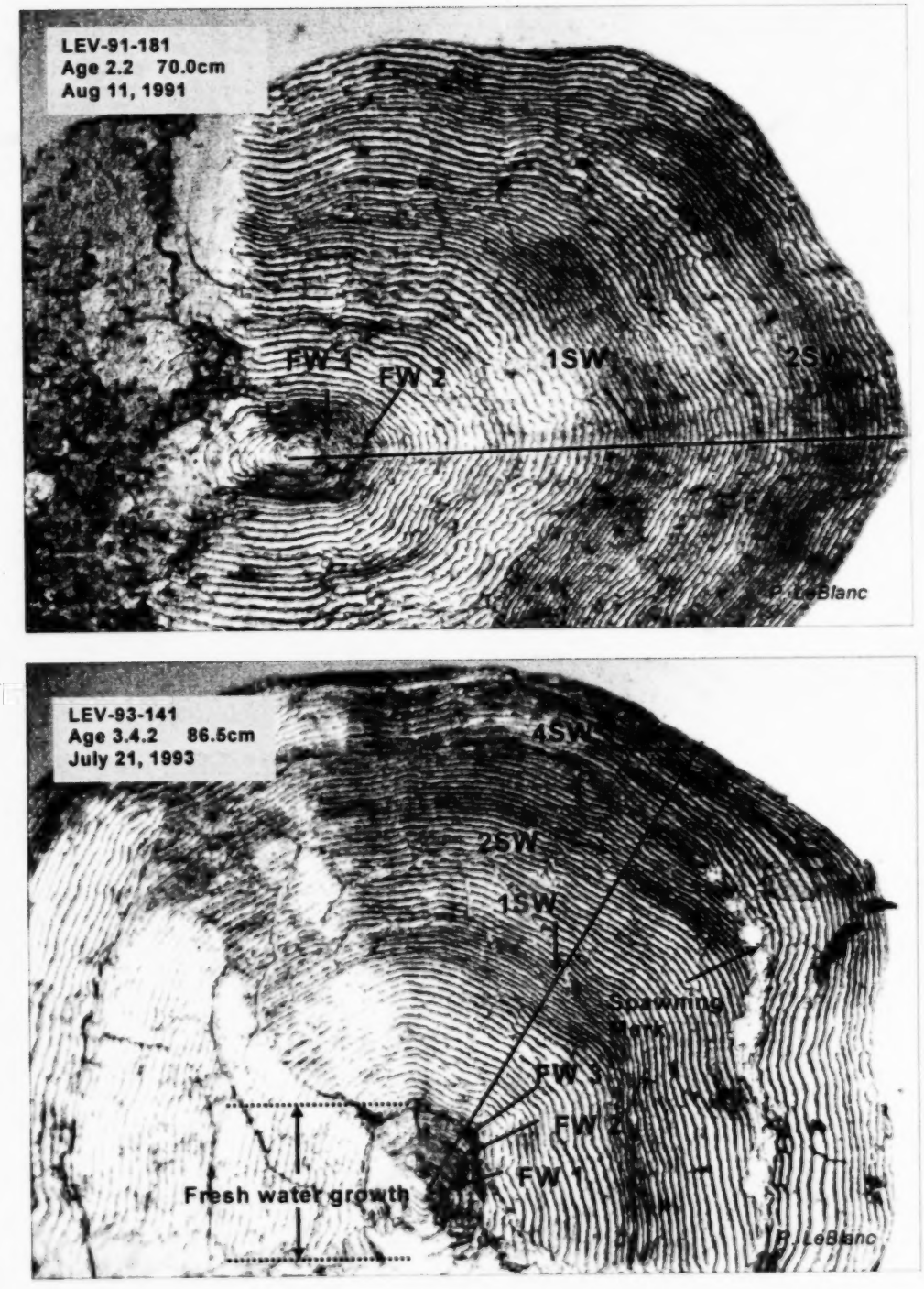


Figure 4. Example of a maiden 2SW (upper) and repeat-spawning 2SW (lower) wild Atlantic salmon scale from the Margaree River.

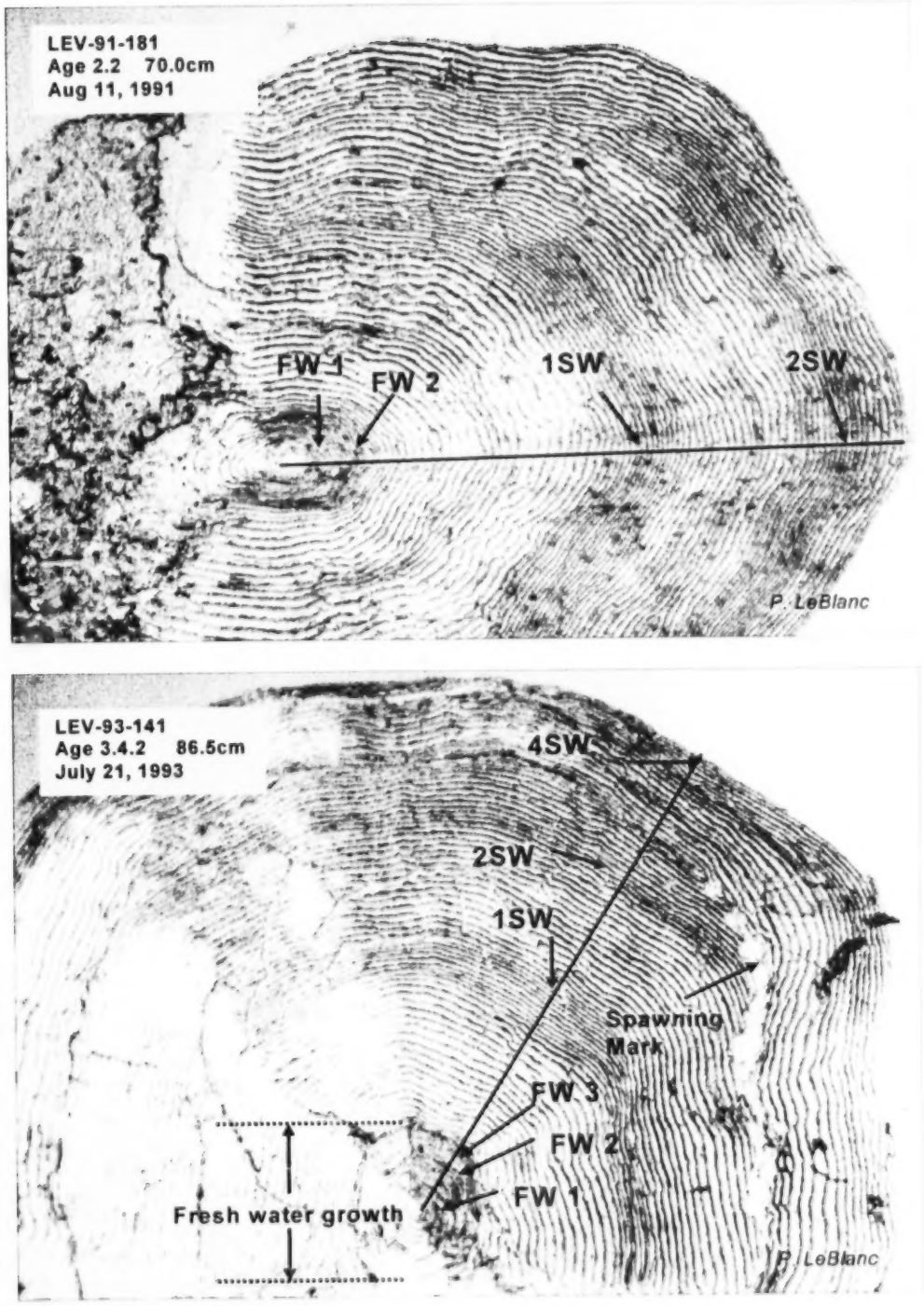
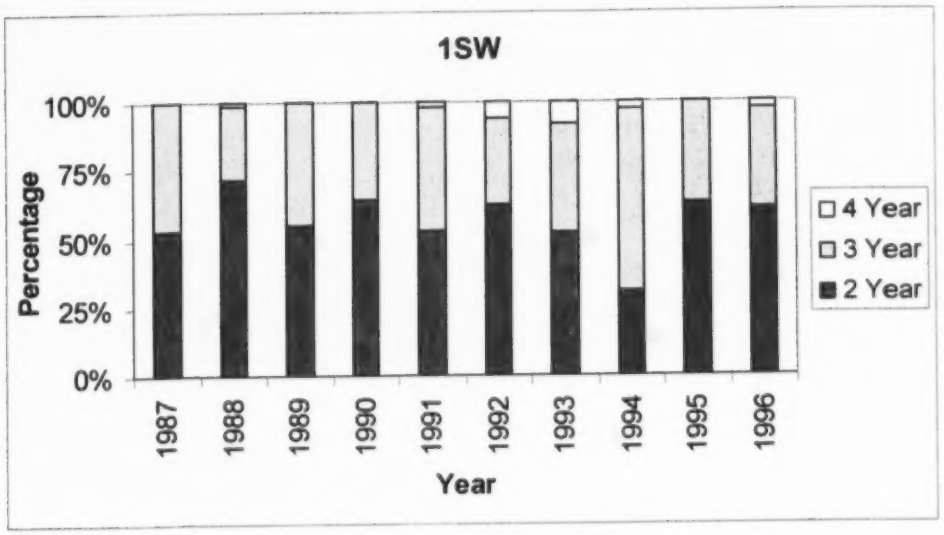


Figure 4. Example of a maiden 2SW (upper) and repeat-spawning 2SW (lower) wild Atlantic salmon scale from the Margaree River.



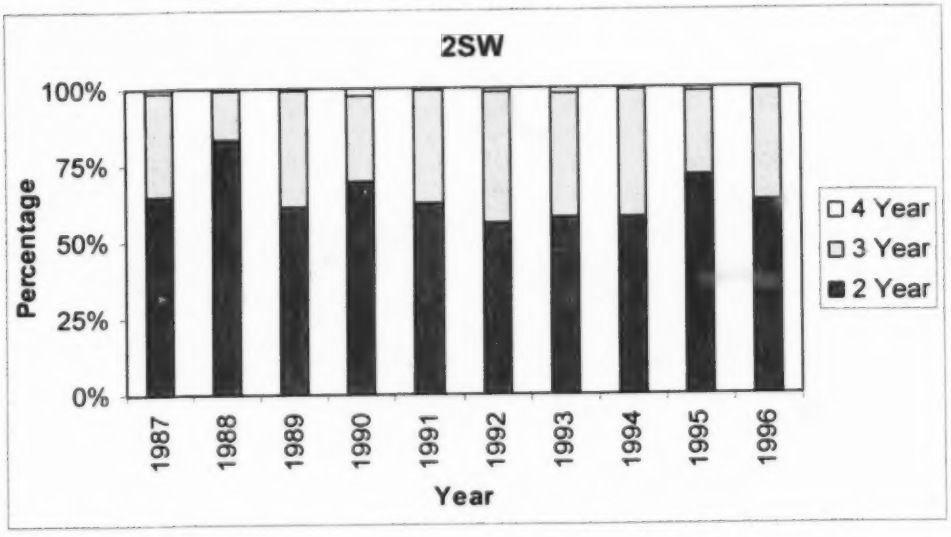


Figure 5. Percentage by freshwater age of wild maiden 1SW and 2SW Atlantic salmon from the Margaree River, by year of return, 1987 to 1996.

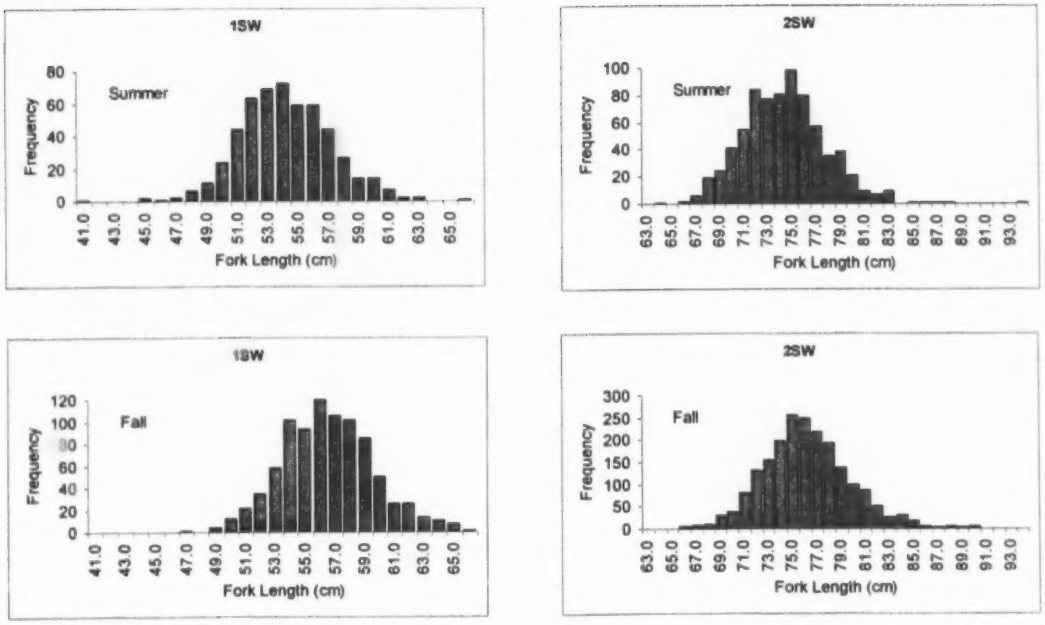


Figure 6. Length frequency distributions by season of wild maiden 1SW and 2SW Atlantic salmon from the Margaree River, 1987 to 1996.

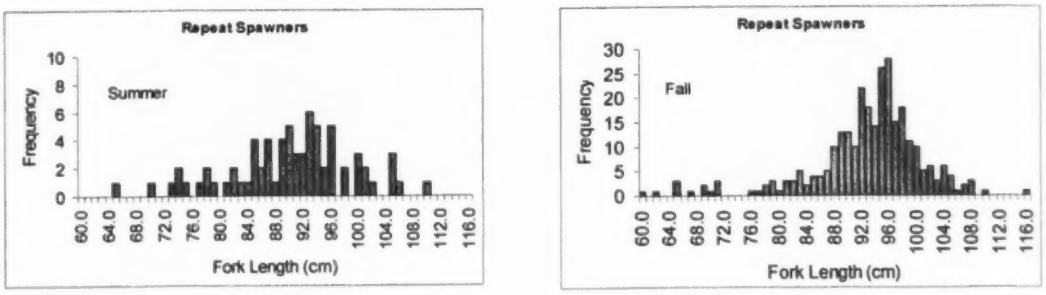


Figure 7. Length frequency distributions by season of wild repeat-spawning Atlantic salmon from the Margaree River, 1987 to 1996.

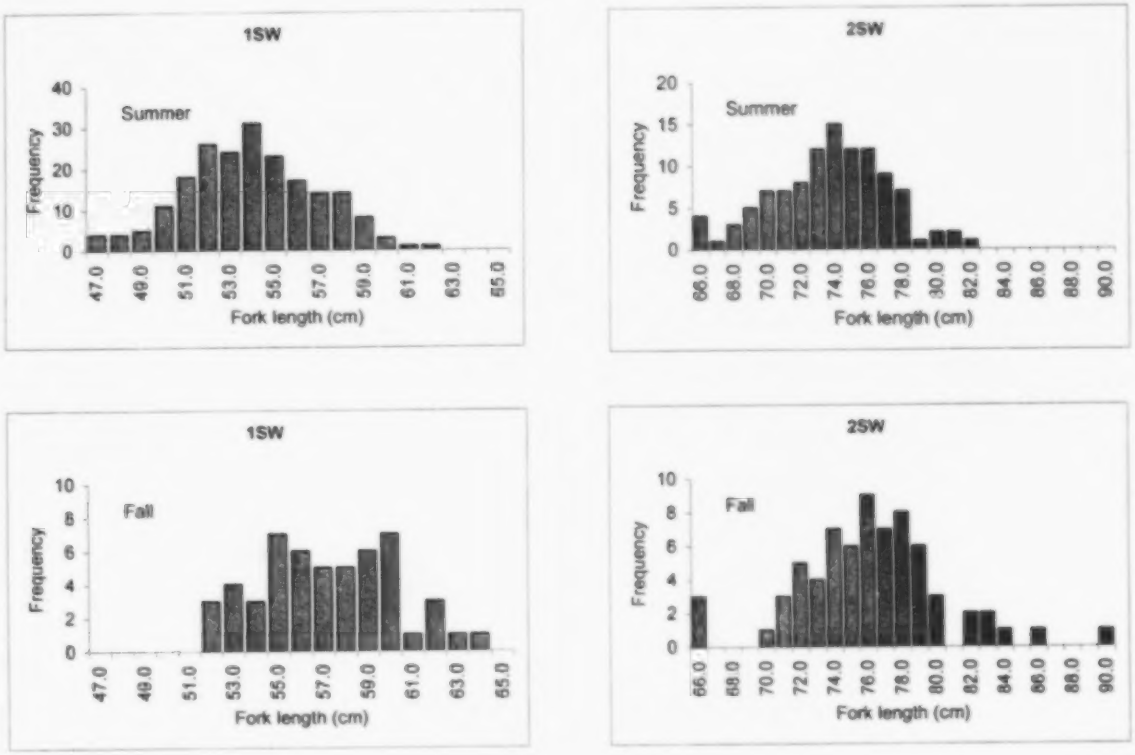


Figure 8. Length frequency distributions by season of hatchery origin maiden 1SW and 2SW Atlantic salmon from the Margaree River, 1987 to 1996.